

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 04 MAY 2005

WIPO

PCT

Applicant's or agent's file reference Hi-bu 042552WO	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/US2004/001977	International filing date (day/month/year) 22.01.2004	Priority date (day/month/year) 22.01.2003	
International Patent Classification (IPC) or national classification and IPC C04B35/80, C04B26/06, C04B35/634, C04B30/02, C04B22/14, C04B22/00, C04B20/00, C04B14/46, F01N7/14			
Applicant 3M INNOVATIVE PROPERTIES COMPANY et al.			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 6 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 4 sheets, as follows: <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).			
4. This report contains indications relating to the following items: <input checked="" type="checkbox"/> Box No. I      Basis of the opinion <input type="checkbox"/> Box No. II     Priority <input type="checkbox"/> Box No. III    Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV    Lack of unity of invention <input checked="" type="checkbox"/> Box No. V     Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI    Certain documents cited <input type="checkbox"/> Box No. VII   Certain defects in the international application <input checked="" type="checkbox"/> Box No. VIII   Certain observations on the international application			
Date of submission of the demand  06.10.2004	Date of completion of this report  06.05.2005		
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer  Raming, T  Telephone No. +31 70 340-4232		



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/US2004/001977

---

**Box No. I Basis of the report**

---

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-32 as originally filed

**Claims, Numbers**

1-21 received on 07.10.2004 with letter of 06.10.2004

**Drawings, Sheets**

1-2 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☒ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☒ the claims, Nos. 22,23
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing *(specify)*:
  - ☐ any table(s) related to sequence listing *(specify)*:
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing *(specify)*:
  - ☐ any table(s) related to sequence listing *(specify)*:

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/US2004/001977

---

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

---

**1. Statement**

Novelty (N)	Yes: Claims	
	No: Claims	1-21
Inventive step (IS)	Yes: Claims	
	No: Claims	1-21
Industrial applicability (IA)	Yes: Claims	1-21
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

---

**Box No. VIII Certain observations on the international application**

---

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/US2004/001977

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

Reference is made to the following documents:

- D1: WO 97/48890 A (MINNESOTA MINING & MFG) 24 December 1997 (1997-12-24)
- D2: US-A-5 736 109 (WATANABE TOSHIYUKI ET AL) 7 April 1998 (1998-04-07)
- D3: EP-A-0 573 834 (MINNESOTA MINING & MFG) 15 December 1993 (1993-12-15)
- D4: WO 99/46028 A (UNIFRAX CORP) 16 September 1999 (1999-09-16)

**1. Modifications (Article 34(2) PCT)**

The amendments filed with the letter dated 06-10-2004 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendment concerned is the following:

The addition of the words "in an amount of 0 to less than 50 weight percent" to claims 1, 7, 10 and 17. The original application only discloses the following range: "in an amount no greater than 50 weight percent".

**2. Clarity and support (Article 6 PCT)**

Although claims 1 and 7 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT. The same accounts for claims 10 and 17. The application should have only one independent product and one independent method claim.

**3. Novelty (Article 33(2) PCT)**

a. Claim 1 claims an end cone insulator, not a pollution control device. The addition of the words "comprising an end cone region of a pollution control device" does not limit the scope of claim 1 to end cone regions that are part of a pollution control device, it merely limits the scope of claim 1 to end cone regions that **might** be used in a pollution control

device, which in practice are all end cone regions.

b. The feature of the bulk shrinkage does not add any limitation to the scope of claim 1 either, since claim 1 does not define between which two situations this shrinkage occurs. For any fiber two different situations can be found (e.g. heating from 25°C to 26°C), between which the shrinkage is less than 10 percent. A definition of the two situations between which the shrinkage occurs, which is given anywhere else as in the claims (description, handbooks, etc.) does not add any limitation to the scope of the claims either, since the scope of the claims is limited only **by what is mentioned in the claims itself**.

c. The amount of "inorganic colloidal material", as defined in claim 1, can be near to zero. Any material containing ceramic fibers will also contain at least a few colloidal inorganic particles, since colloidal inorganic particles, specially silica colloidal particles, are very common as contaminants, and also result as wear material from the fibers. The little pieces that break off from ceramic fibers can be regarded as colloidal particles. Most dust particles can be considered as an inorganic colloidal particles. Only in the case that the colloidal particles would be defined as a specific type of colloidal particle that is not likely to be present as an accidental contaminant, or in the case that the minimum amount of colloidal particles is substantially higher than zero, thereby excluding the amount that normally is present as contaminant, would the presence of colloidal particles be regarded as a limiting feature.

d. The applicant defines in claim 1 that the article is free of intumescent material. The word "intumescent" defines a property, but not any specific material, and therefore does not exclude any material beforehand. Only in the case that it is specifically mentioned in the prior art, as in document D2, that a certain additive is intumescent, the feature "free of intumescent material" will become limiting.

e. The relative term "flexible" used in claim 5 is only a relative term which is not connected with a generally recognised definition. Such a relative term can not be used to distinguish an invention over the prior art (Guidelines for PCT Examination, part C III, 4.5). As mentioned before, the scope of the claims is limited only by what is mentioned in the claims itself, not by anything that is mentioned in the description.

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/US2004/001977

f. Regarding the aforementioned sections, claim 1 of the present application in fact does not define anything more than an article that at least partially has a conical shape and comprises ceramic fibers and up to 50 wt% of colloidal inorganic particles. In claim 7 at least the composition of the ceramic fibers is defined to a certain extent.

g. Document D1 describes a composite insulating material. Example 1 describes a vacuum molding process for the synthesis of a ceramic end cone. A slurry containing water, 50 wt% S2 glass fibers, 50 wt% ceramic SAFFIL (alumina) fibers and organic binder (**and no inorganic binder**) was deposited on a permeable mould with the shape of a catalytic converter end cone. By applying a vacuum the end cone was dried. The resulting, self-supporting and seamless end cone was heated at 1100°C for a 4-hour period. This treatment should lead to the crystallisation and thus ceramisation of the S2 glass fibers (as for instance is clear from D3, page 2, lines 31-37 and lines 56-59), which contain 64-66% SiO<sub>2</sub> and 24-26% Al<sub>2</sub>O<sub>3</sub>, with the remainder being MgO (as can be found from product specification). Figures 2 and 3 show the construction of the catalytic converter. The insulating material (40) is attached to an end cone housing.

The subject-matter of document D1 is, also regarding points 3a-3f of this communication, prejudicial to the novelty of claims 1-21, thereby not meeting the criteria of Article 33(2) PCT.

**CLAIMS**

1. An article comprising an end cone region of a pollution control device, said end cone region comprising an end cone insulator, said end cone insulator comprising (a) ceramic fibers having a bulk shrinkage no greater than 10 percent using the Thermal Mechanical Analyzer test and (b) inorganic colloidal material in an amount of 0 to less than 50 weight percent based on a weight of the ceramic fibers, wherein said end cone insulator is self-supporting, seamless, conical, and free of intumescent material.
2. The article of claim 1, further comprising an end cone housing of a pollution control device attached to an inner surface of the end cone insulator, attached to an outer surface of the end cone insulator, or a combination thereof.
3. The article of claim 1, wherein the ceramic fibers comprise  $\text{Al}_2\text{O}_3$  in an amount of at least 20 weight percent and  $\text{SiO}_2$  in an amount of at least 30 weight percent based on the weight of the ceramic fibers.
4. The article of claim 3, wherein the ceramic fibers are crystalline, microcrystalline, or a combination thereof.
5. The article of claim 1, wherein the end cone insulator is flexible.
6. The article of claim 1, wherein said end cone insulator further comprising an organic binder.
7. An article comprising an end cone region of a pollution control device, said end cone region comprising an end cone insulator, said end cone insulator comprising (a) ceramic fibers comprising  $\text{Al}_2\text{O}_3$  in an amount of at least 20 weight percent and silica in the amount of at least 30 weight percent based on the weight of the ceramic fibers, said ceramic fibers

- 2 -

- being microcrystalline, crystalline, or a combination thereof and (b) inorganic colloidal material in an amount of 0 to less than 50 weight percent based on the weight of the ceramic fibers, wherein said end cone insulator is self-supporting, seamless, conical, and free of intumescent material.
8. The article of claim 7, further comprising an end cone housing of a pollution control device attached to an inner surface of the end cone insulator, attached to an outer surface of the end cone insulator, or a combination thereof.
  9. The article of claim 7, said insulator further comprising an organic binder.
  10. A method of making an end cone region of a pollution control device, said end cone region comprising an end cone insulator, said method comprising:
    - preparing an aqueous slurry comprising (a) ceramic fibers having a bulk shrinkage no greater than 10 percent using the Thermal Mechanical Analyzer test and (b) inorganic colloidal material in an amount of 0 to less than 50 weight percent based on a weight of the ceramic fibers;
    - vacuum forming a conical-shaped preform from the aqueous slurry on a permeable forming die;
    - drying the preform to produce the end cone insulator, said end cone insulator being self-supporting, seamless, conical, and free of intumescent material.
  11. The method of claim 10, wherein said vacuum forming further comprises inserting the preform into or onto a shape-retaining device while the preform is supported by the permeable forming die, transferring the



preform to the shape-retaining device, and removing the permeable forming die.

12. The method of claim 10, wherein the shape-retaining device is an inner end cone housing or an outer end cone housing of an end cone region of a pollution control device.
13. The method of claim 12, wherein the end cone insulator is attached to the end cone housing.
14. The method of claim 10, wherein the ceramic fibers are microcrystalline or crystalline.
15. The method of claim 10, wherein the ceramic fibers comprise  $\text{Al}_2\text{O}_3$  in an amount of at least 20 weight percent and  $\text{SiO}_2$  in an amount of at least 30 weight percent based on the weight of the ceramic fibers.
16. The method of claim 10, wherein the ceramic fibers comprise  $\text{Al}_2\text{O}_3$  in an amount of at least 20 weight percent and silica in the amount of at least 30 weight percent, the ceramic fibers are crystalline, microcrystalline, or a combination thereof, and the slurry further comprises an organic binder.
17. A method of making an end cone region of a pollution control device, said end cone region comprising an end cone insulator, said method comprising:
  - preparing an aqueous slurry comprising (a) ceramic fibers comprising  $\text{Al}_2\text{O}_3$  in an amount of at least 20 weight percent and silica in the amount of at least 30 weight percent based on the weight of the ceramic fibers, said ceramic fibers being microcrystalline, crystalline, or a combination thereof and (b) inorganic colloidal material in an

- amount of 0 to less than 50 weight percent based on the weight of the ceramic fibers;
- vacuum forming a conical-shaped preform from the aqueous slurry on a permeable forming die; and
  - drying the preform to produce the end cone insulator, said end cone insulator being self-supporting, seamless, conical, and free of intumescent material.
18. The method of claim 17, wherein said vacuum forming further comprises inserting the preform into or onto a shape-retaining device while the perform is supported by the permeable forming die, transferring the preform to the shape-retaining device, and removing the permeable forming die.
19. The method of claim 17, wherein the shape-retaining device is an inner end cone housing or an outer end cone housing of a pollution control device.
20. The method of claim 18, wherein the end cone insulator is attached to the end cone housing.
21. The method of claim 17, wherein the slurry further comprises an organic binder.